goods and passengers; the proposals of Medhurst in 1810, of Vallance (of Brighton), and others. It appeared that the first intentions were, to have exhausted cylinders of considerable area, within which the carriages should travel; but as it naturally was objected that the passengers might not approve of this mode of conveyance through a continuous tunnel, means were devised for connecting the piston within the tube with the carriages travelling upon the rails outside it; and, after numerous attempts, Messrs. Clegg and Samuda succeeded in the system described, and which, after being tried for some time, imperfectly, at Wormwood Scrubs, has been carried out practicably on the line from Kingstown to Dalkey, near Dublin, a distance of 1¾ miles, up a series of inclines averaging 1 in 115.

It appeared that most of the previous attempts had failed chiefly because the continuous valve was defective, and that Mr. Clegg suggested the use of wax and tallow, which had proved so successful as a means of hermetically sealing up the opening caused by the passage of each train.

The manner of applying the power was then examined, and the adaptation of the electric telegraph, for giving the signals of the time for starting the engines at periods along the line, was shewn. The accumulation of power in the main, from forming a vacuum previously to the arrival of the train at each division, was shewn to be in proportion to the degree of vacuum which was formed.

The friction of the various working parts was stated to be very small, and that on the Kingstown and Dalkey line it was scarcely appreciable.

The leakage of the valve, &c. was then examined, and if was argued, that the power lost by leakage was inversely as the speed of the trains, for the faster the piston passed along, the less time the pipe would be under exhaustion, and consequently the less time would the leakage exist. Experiments upon the 15 in. main, on the Dalkey line, shewed that five horses' power would be required to overcome the leakage of three miles of railway.

The system was stated to be peculiarly applicable to such steep inclines as, with locomotive engines, would be called bad gradients; for so long as the steepness of the inclines was not too great for the trains to descend without the use of the break, no power was lost, and the cost of working was no greater than on a dead level, for the whole of the additional power required to overcome gravity, while ascending the incline, was restored in descending, particularly when the planes were of great length, and at a convenient inclination; in which latter case, there would be a slight saving in working an undulating line.

The safety from collision between the trains was much argued upon, and it was stated to be impossible for the trains to approach nearer than three miles to each other, unless at the stations especially appointed for the purpose. Single lines of railway could therefore be worked with safety.

The cost of working was then fully examined, and, taking for data the results of the expenses on the Dalkey line, and supposing the system to be adapted to a line of 112 miles long, similar to the London and Birmingham Railway, on which the cost of working with locomotives was stated to be:—

Per train per mile, for haulage .... 15d.
Ditto for maintenance 8½d.

The cost of working the atmospheric apparatus would be:—

Per train per mile, for haulage.... 3.4.4d.
Ditto for maintenance 5.7.8d.

with the additional advantage of travelling at a mean speed of 50 miles per hour, instead of between 20 and 25 miles per hour, as with the locomotive system.

The discussion of the paper, and upon the merits of the system, was commenced, but as the interest of it would be lost by giving it in a disjointed form, it is reserved until after the meeting of Tuesday, the 21st inst., when the discussion will be renewed.

The papers announced to be read at the meeting of May 21st were:—

No. 670. "Account of the plan adopted by William Preston White for raising the Innisfail steamer, sunk in the river Lee, near Cork (Ireland)," by G. P. White, Assoc. Inst. C.E.

No. 552. "Essay upon the causes of preventing and method of determining the amount of priming in Steam Boilers," by R. Pollock.

No. 678. "Description of a Coffer-dam used for closing the end of the Building-slips at H.M.'s Dockyard, Woolwich," by B. Snow, Assoc. Inst. C.E.

COOKE'S ELECTRIC TELEGRAPH FOR THE SAFE WORKING OF SINGLE LINES OF RAILWAY.

The extraordinary saving in the formation of railways where a double line can be dispensed with, and safety and punctuality secured by only a "single line," with tidings at proper intervals, renders the full elucidation of the powers of this invention of the utmost importance, not only to projectors and engineers of proposed new lines, but to the public at large. W. F. Cooke, Esq., having been requested by several gentlemen connected with railways to give them an opportunity of inspecting the apparatus, previous to its being sent to its destination, the Norwich and Yarmouth Railway, it was exhibited in operation at the Society of Arts, Mr. Cooke attending to give any explanation required. The principle on which this form of telegraph is constructed is founded on Oersted's celebrated discovery, that a magnetic compass needle may, through the agency of a voltaic current, be invested with an artificial polarity; and that a magnetic needle placed parallel, and near to a conducting wire, will, during the transmission of the current, stand at right angles to the line. The apparatus for carrying out this principle consists of a handsome polished mahogany case, precisely similar in a modern chiffonier, the lower part containing the batteries, the upper five dials with magnetic pointers in the centre of each, as follows, with a handle to each:—

Up.	Down.	Up.	Down.	Up.	Down.	Up.	Down.	Up	Down.
Norwich.		Brandon Junction.		Brundall.		Reedham.		Yarmouth.	

Above this is a case of smaller dimensions, containing the "Speaking Telegraph," having a dial, with the letters of the alphabet; numerals, &c., with two magnetic pointers, shandles, and a variety of conventual signals, &c., together forming an elegant structure of cabinet-work, about five feet six inches in height; the pointers are suspended vertically, on an axis moving freely through the face of the dial; behind is another magnetic pointer, so that they move together on the same axis; the conducting wire is coiled many times longitudinally round a frame in which the magnet moves, to subject the magnet to the multiplied deflecting force of the voltaic current; and the magnet's motion is limited on both sides by stops. The motion of the handle either right or left completes the circuit of the conducting wire with the voltaic battery, and deflects the needle in the same direction. The length of the Norwich and Yarmouth line is 20¼ miles, with two intermediate sidings at Reedham and Brundall. The conducting wires extend along the whole line, suspended in the air on wooden standards nine feet high; strong posts of timber are firmly fixed in the ground every quarter of a mile, from which the wires are strained, and between every two "straining posts" are placed seven others, 55 yards apart, for supports. There are a number of winding apparatus on each straining post and at *all* the wires, and carefully insulated by being attached to non-conductors, of earthenware, and covered with boxes with holes for the clear passage of each wire, as, if not perfectly insulated in wet weather, the dampness of the wood in connection with the fire would conduct the electric current into the earth. The experiments at the Society of Arts were highly interesting and satisfactory to all who have witnessed them. Six telegraphs were stationed in distant parts of the Society's rooms in the Adelphi, and the correspondence kept up was perfect and rapid. General Pasley has carefully investigated its action, and approves of it in every respect, and took notes of the number of signals, &c. it passes in a minute. The Lords of the Admiralty also honoured Mr. Cooke with a visit last week, and expressed their high satisfaction at the result of all the experiments exhibited at the Adelphi, as well as on the Great Western from Paddington to Slough.

COLLECTIONS TOWARDS A GLOSSARY OF ARCHITECTURE.—No. VI.

Exchange.—The place in which merchants, brokers, and others meet to transact business.

The interest which is taken by the public in the New Royal Exchange induces me to submit to the readers of the BUILDER a few observations on the subject.

In the time of Henry the Eighth, and long afterwards, such a building was called the *Burse*. This word, as well as *purse*, is evidently derived from the Greek βυρσα, *bursa*, which comes from a Hebrew word, signifying *a skin* or *hide*, the substantive of a verb which means to sever, because the skin is separated from the body. The word is found in many languages: in Latin *bursa* stands for an *ox-hide*, as well as for a *purse*, which, like bottles, were anciently of leather, made of course from skins.*

When Dido obtained her territory in Carthage, by inclosing a space of ground by means of a bull's hide cut into small thongs, she built in the midst a citadel, which she called Byrsa, to commemorate the exploit.

Devenere locos, ubi nunc ingentia cernes
Mœnia, surgentemque novæ Carthaginis arcem;
Mercatique solum, facti de nomine Byrsam,
Taurino quantum possent circumdare tergo.
Virgil, Æn. I. 365.

Hence the name was given to the place in which merchants were accustomed to meet, which in Paris is called *la Bourse Royale*, whilst in Italian the term, *Borsa de' Mercanti*, implies the spot

"Where merchants most do congregate."

In our language the treasurer of Colleges at the Universities is called a Bursar; and we say to disburse, to reimburse.

Mr. Gwilt, in his Encyclopædia of Architecture (p. 799), observes that "the Exchange at Amsterdam seems for a long time to have prevailed as the model for all others. It was commenced in 1608, and finished in 1613, and its architect was Cornelius Dankers de Ry. It is about 271 feet long, and about 152 feet wide. The whole edifice is supported on three large arcades, under which flow as many canals. On the ground floor is a portico surrounding a court, above which are halls supported on 46 piers. The divisions are numbered and assigned each to a particular nation, or class of merchants. In the court, and within the enclosure, is the place of meeting for mercantile affairs."

The first Royal Exchange in London, however, was commenced in the year 1566 by Sir Thomas Gresham, son of Sir Richard Gresham, called "the King's Merchant," who had endeavoured, but in vain, to erect a suitable building for the merchants, hitherto accustomed to meet in the open air. In the year 1571, Queen Elizabeth went from the house of Sir Thomas Gresham to visit the new "Burse;" and "after that she had viewed every part thereof above the ground, especially the *Pawne*, which was richlie furnished with all sortes of the finest wares in the city, she caused the same to be proclaimed the *Royall Exchange*, and so to be called from thenceforth, and not otherwise." The building of Sir Thomas Gresham was almost entirely consumed in the great fire in 1666, and the new structure was from the designs of one of the city surveyors, Mr. Edward Jerman, and not, as has been supposed, from those of Sir Christopher Wren. The new Exchange was opened in 1669; it was considerably repaired in 1767, and again in 1820, when the stone tower was rebuilt, from the design of Mr. George Smith. A second time has the 'Change been destroyed by fire, and again it has arisen from its ashes. The new building, which is familiar to most persons, is designed by Mr. William Tite, and is rapidly approaching its completion. Its portico is a copy of the famous entrance to the Pantheon at Rome.

Mr. Gwilt considers the Bourse of Paris an admirable model, both in distribution and design, and describing it, says—"The edifice in question was begun, in 1808, under the designs of Brogniart, and completed by Labarre at a much protracted period. The general

* Thus, in the New Testament, when we read of the danger of putting new wine into old bottles (Luke v. 37), we must understand that the bottles were made of skins, just as in the present day in Italy and other warm countries, wine is kept in bottles of skins.